

Chapter 6

Further information

Identification of other vines and scramblers

While cat's claw creeper and Madeira vine are two of the most impactful invasive vines and scramblers, many other species also pose a threat to biodiversity in Australia. Rubber vine (*Cryptostegia grandiflora*) and the asparagus weeds are also listed as WoNS and have best practice management resources available (Doak and Deveze, 2004; OEH, 2013).

Plant profiles for some of Australia's introduced and native vines and scramblers, including information on their distribution and key identification characteristics, can be found below. Plants featured are sometimes found to co-occur with cat's claw creeper and/or Madeira vine.

Introduced species



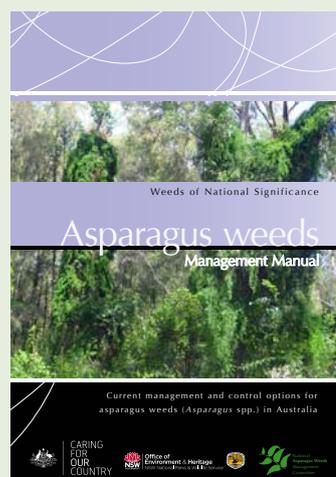
WoNS
WEEDS OF
NATIONAL
SIGNIFICANCE

Asparagus weeds—*Asparagus* spp.

Seven species in the genus *Asparagus* are listed as WoNS and several other species are present in Australia as potential future weeds (OEH, 2013). All species are either climbers or scramblers; their shoots are modified into leaf-like structures called 'cladodes'; and they often have extensive root and underground tuber systems that make control difficult.

The species that climb into the canopy of forests are climbing asparagus (*Asparagus africanus*), climbing asparagus fern (*A. plumosus*) and bridal creeper (*A. asparagoides*). The common scrambling species are ground asparagus (*A. aethiopicus*) and bridal veil (*A. declinatus*).

For more information on the identification and management of asparagus weeds, see the *Asparagus weeds Management Manual: Current management and control options for asparagus weeds (Asparagus spp.) in Australia* (OEH, 2013).



The Asparagus weeds Management Manual is a great resource for managing asparagus weeds.

© M. Fagg 1998



R.G. & F.J. Richardson



R.G. & F.J. Richardson



Bridal creeper (A. asparagoides).



M. Fagg 2006

Climbing asparagus (A. africanus).



R.G. & F.J. Richardson



R.G. & F.J. Richardson



R.G. & F.J. Richardson

Ground asparagus (A. aethiopicus).



Leaves and flowers (left), and mature fruit (right) of *C. grandiflorum*. Note that immature fruit are green.

Balloon vines—*Cardiospermum grandiflorum* and *C. halicacabum*

Two closely related invasive vine species have the common name balloon vine (*Cardiospermum grandiflorum* and *C. halicacabum*). *Cardiospermum grandiflorum* has larger leaves and leaflets, fruit and flowers, but it is best to differentiate the two species by hairs: *C. grandiflorum* is densely hairy and *C. halicacabum* is finely hairy to almost hairless.

Cardiospermum grandiflorum is widely distributed in eastern Australia, from south-eastern NSW to northern Qld, and some populations are present in south-eastern SA and around Perth in WA. *C. halicacabum* mainly occurs in northern Australia from northern WA to northern Qld, though it is also present in southern Qld and NSW.

Key ID characteristics:

- compound leaves arranged in three groups of 3 leaflets
- tendrils growing out of the end of flower spikes
- papery balloon-shaped fruit.



C. halicacabum fruits.



C. halicacabum leaves and flowers.

Blue thunbergia—*Thunbergia grandiflora*

Blue thunbergia is a scrambling vine that can grow to 15 m in height. It is native to India and was introduced to Australia as an ornamental plant. It now is a major threat to native vegetation in northern Qld, and scattered populations are present in South East Qld (Brisbane City Council, n.d.).

Key ID characteristics:

- oppositely arranged leaves, variable in shape from almost triangular with entire margins, to oval shaped with irregular pointed lobes
- trumpet-shaped flowers, blue with a white throat; clustered in inflorescences on drooping branches.



Trumpet-shaped, blue flowers of blue thunbergia.

Chapter 6

Brazilian nightshade—*Solanum seaforthianum*

Brazilian nightshade is a common vine or scrambler in coastal eastern Australia, with records from southern NSW to North Qld.

Key ID characteristics:

- leaves that are pinnatisect (resemble compound leaves, but are simple leaves with lobes almost to the midrib)
- large inflorescences that hang below stems and contain 10–50 purple flowers
- bright red, glossy berries, 1 cm wide.



Brazilian nightshade pinnatisect leaves (left) and clustered purple flowers (right).



Brazilian nightshade berries.

Cape ivy—*Delairea odorata*

Cape ivy is an herbaceous climber introduced from South Africa. It is present in moist, shady areas in south-eastern Australia (coastal areas of SA, Vic, NSW and Tas) as well as south-western WA.

Key ID characteristics:

- glossy green leaves with 5–7 points
- succulent texture to stems and leaves
- small yellow flowers, present in many flowered clusters.

The leaves of Cape ivy are similar to those of English ivy, though Cape ivy is a fleshier plant, while English ivy is woody.



Twining stems and leaves of Cape ivy.



Cape ivy flowers.

Crab's eye creeper—*Abrus precatorius* subsp. *africanus*

Crab's eye creeper is a woody twiner up to 10 m tall with characteristic red seeds with black dots that resemble crabs' eyes. It is mainly found in South East Qld, though there are populations in coastal Central Qld as well (Atlas of Living Australia 2022).

Key ID characteristics:

- compound leaves with 5–17 leaflets, 5–25 mm long, 2–8 mm wide and oblong in shape
- pink to purple flowers
- brown seed pods, broad, sparsely hairy with a rough texture
- bright red seeds that can remain on the plant for several months.

It should be noted that there is a native form of crab's eye creeper (*Abrus precatorius* subsp. *precatorius*) that is very similar in appearance to the exotic. The native form is distributed across tropical northern Australia, and there is currently minimal overlap in the distribution of the two forms, though this could change in the future. The best way to tell the two forms apart is the texture of the pod, which is rough in the exotic (subsp. *africanus*) and smooth in the native (subsp. *precatorius*).



R.C.H. Shepherd

The pinnately compound leaves of crab's eye creeper.



© M. Fagg 2017

Crab's eye creeper's bright red seeds with black dots that remain on dried pods.

Chapter 6

Dutchman's pipe—*Aristolochia elegans*

Dutchman's pipe is a vigorous woody climber with showy leaves and fruit, and kidney-shaped leaves that release an unpleasant smell when crushed. It is mainly present on the north coast of NSW and coastal Qld, where it displaces native vines and is poisonous to the larvae of birdwing butterflies.

Key ID characteristics:

- large, purple flowers
- long, channelled seed pods that open up from the top
- kidney-shaped leaves
- ear-shaped stipules (appendages at the base of the leaf stalk).



© B.Gray 1998

Seed pods open from the top.



Forest & Kim Starr

Dutchman's pipe's spectacular flower.



Forest & Kim Starr

Dutchman's pipe kidney-shaped leaves.



Forest & Kim Starr

Dutchman's pipe leaf with ear-shaped stipule at stalk base.

English ivy—*Hedera helix*

English ivy is a common ornamental plant in gardens. As such it has become a garden escape and is often growing in disturbed areas such as parklands in southern Australia (NSW, Vic, ACT, SA and Tas).

Key ID characteristics:

- leaves dark green, often with variegations of white throughout, and with 3–5 pointed tips
- grows up structures using aerial roots along the stem.



R.G. & F.J. Richardson

English ivy foliage.



R.G. & F.J. Richardson

English ivy growing up a tree trunk using aerial roots.

Glory lily—*Gloriosa superba*

Glory lily is a perennial scrambler with annual stems that die back each winter and re-sprout from an underground tuber in the summer. It is widely cultivated as an ornamental because of these flowers, and several cultivars are still present for sale in Australia. In subtropical and tropical coastal eastern Australia it is a major invader of sandy coastal forests, such as littoral rainforest and coastal scrub, with heavy infestations containing 70–100 tubers/m², which can re-sprout new stems (Weeds of Australia, 2022). All parts of glory lily are poisonous and potentially fatal to humans and animals.

Key ID characteristics:

- striking flowers with six yellow to red petals that sit above 6 lengthened yellow to orange stamens
- leaves are fleshy and have a coiled tendril at the tip.



R.G. & F.J. Richardson

Glory lily flower.



R.G. & F.J. Richardson

Glory lily leaves with coiled tendril at tips.

Chapter 6

Glycine—*Neonotonia wightii*

Glycine is an herbaceous climber or scrambler that can become woody at the base. It invades disturbed areas and the edges of rainforest in tropical and subtropical areas of eastern Australia.

Key ID characteristics:

- stems densely hairy to hairless
- compound leaves with 3 oval leaflets, 1–10 cm long and 1–7 cm wide
- white to mauve flowers, turning orange with age
- seed pods 1–4 cm long and 0.5 cm wide; rusty in colour and densely hairy.



© Australian National Botanic Gardens 1998

Hairy seed pods of glycine.

Japanese honeysuckle—*Lonicera japonica*

Japanese honeysuckle was introduced to Australia as an ornamental, but it now invades forests on the east coast from South East Qld to Tas, and from Perth to Albany in WA.

Key ID characteristics:

- leaves oppositely arranged, oval shaped, 2–8 cm long and 1–4 cm wide, variable in shape (often deeply lobed in young plants, though entire on older plants)
- young stems densely hairy, older stems hairless, woody and often with strings of bark peeling off
- tube-shaped flowers, 2–3 cm long, starting white and becoming yellow or orange with age.



R.G. & F.J. Richardson

Japanese honeysuckle leaves and flowers.

Kudzu—*Pueraria lobata*

Kudzu is a native of China and Japan that caused large scale impacts as an invader in the USA; however, in Australia its distribution is limited. This is likely because of its limited dispersal ability: it rarely produces viable seeds and relies on vegetative reproduction (Lindgren et al., 2013). In the USA it was promoted as a pasture crop and for erosion control, which caused it to become widespread, smothering vegetation and crops thanks to its extremely fast growth rates (Lindgren et al., 2013). In Australia, it might not achieve a wide distribution, but its rapid growth can cause serious local impacts. There are currently significant infestations in north-eastern NSW and South East Qld.

Key ID characteristics:

- leaves large, divided into three leaflets, lobed or unlobed
- flowers in clusters on a spike growing out of the leaf axis, pink to purple with a yellow spot at base
- deep roots and large underground tubers that reach almost 2 m in length and can weigh 180 kg.



Forest & Kim Starr

Purple flowers and slightly lobed leaves of kudzu.

Mikania vine—*Mikania micrantha*

Mikania vine is listed as one of the top 100 worst environmental weeds in the world (GISD, 2024). However, its distribution in Australia is limited: it is recorded only in coastal northern Qld and Christmas Island. Nonetheless, it is important to be on the lookout for new infestations because of the species' invasiveness in other countries.

Key ID characteristics:

- oppositely arranged heart-shaped to triangular leaves with toothed margins
- flowers in fluffy white clusters that grow out of the leaf axils or at the end of branches.



© M. Fagg 2012

Leaves and flowers of mikania vine.

Chapter 6

Morning glories—*Ipomoea* spp.

Multiple morning glory species are present in Australia as invasive vines. The main ones that threaten biodiversity are coastal morning glory (*Ipomoea cairica*), common morning glory (*I. purpurea*) and morning glory (*I. indica*). All morning glory species have showy trumpet-like flowers that differ in colour between species.

Coastal morning glory (*Ipomoea cairica*) is widely spread across eastern Australia, and less so in WA. It invades disturbed forests and riparian areas. It has:

- pink flowers
- palmate (hand-shaped) leaves with 5–7 points.



R.C.H. Shepherd

Coastal morning glory (*I. cairica*) leaves with five finger-like lobes and pink flowers.



© M. Fagg 2009

Purple flowers and heart-shaped leaves of common morning glory (*I. purpurea*).

Common morning glory (*Ipomoea purpurea*) is an annual climber mainly found in temperate and subtropical coastal NSW and Qld. It has:

- hairy stems
- large (10 cm wide) heart-shaped leaves
- deep purple flowers with a pale throat.

Morning glory (*Ipomoea indica*) is mainly found in coastal NSW and Qld, though there are records of populations in all states except NT and ACT. It has:

- 3-pointed lobed leaves
- purple flowers with a pink centre.



R.G. & F.J. Richardson

Purple flowers and 3-lobed leaves of morning glory (*I. indica*). Note the pink centre of these flowers compared with the white centre seen in common morning glory (*I. purpurea*) (above).

Other *Ipomoea* species that are potential threats to biodiversity include *I. alba*, *I. quamoclit*, *I. hederifolia* and *I. triloba*.

Moth vine—*Araujia sericifera*

Moth vine is a common weed in NSW and South East Qld, and is also naturalised in Vic, SA and south-western WA. It grows up to 5 m into the canopy. All parts of moth vine are poisonous to humans and livestock.

Key ID characteristics:

- leaves are spear shaped, 3–12 cm long and 1–6 cm wide
- undersides of the leaves are pale green to white with a dense covering of tiny hairs, producing a felty texture. The tip of the leaf is usually twisted
- fruit are large and resemble chokos (though are toxic), and contain many wind-dispersed seeds.



© M. Fagg 2009

Leaves and choko-like fruit of moth vine.



R.C.H. Shepherd

Flower of moth vine.

Moth vine is very similar in appearance to the native milk vine (*Leichhardtia rostrata*) but can be differentiated by the underside of the leaves: milk vine has hairless, glossy undersides, unlike the hairy undersides of moth vine leaves.



© M. Fagg 1993

Native milk vine leaves and flowers.

Passionfruits—*Passiflora* spp.

There are multiple *Passiflora* species present in Australia, with some native and some exotic. The main exotic weeds are:

- blue passionfruit (*P. caerulea*).
- corky passionfruit (*P. suberosa*)
- stinking passionfruit (*P. foetida*)
- white passionfruit (*P. subpeltata*).

All *Passiflora* species are tendril climbers and usually have lobed leaves on long leaf stalks, though they show variation in most other characteristics. Identification of *Passiflora* species can primarily be undertaken through examination of leaf characteristics, the presence of glands along leaf stalks, stipules and the colour and size of flowers and fruits.

Chapter 6

Blue passionfruit is primarily present along the edges of rainforests and disturbed sites, from South East Qld along the coast through NSW, Vic, SA and Tas. It has:

- leaves with 5 deep, rounded lobes
- 2–4 glands in the middle of the leaf stalk
- leafy stipules, 1–2 cm long
- flowers 6–8 cm wide, blue to purple
- fruit 6 cm long, yellow to orange.



R.G. & F.J. Richardson

The five-lobed leaves and orange fruit of blue passionfruit.



R.G. & F.J. Richardson

Blue passionfruit has striking flowers (left) and leafy stipules.

M. Fagg 2013

Corky passionfruit invades the edge of forests and other disturbed areas from north of Wollongong, NSW to north Qld and across to Darwin, NT. It has:

- mature stems that are corky; younger stems are slender and herbaceous
- leaves with three pointy lobes
- 2 raised glands in the middle of the leaf stalk
- smaller flowers and fruit than most other *Passiflora* species (both around 15 mm in diameter).



© M. Fagg 2013

Flower, fruit and 3-lobed leaves with pointy tips of corky passionfruit.



Adam Bernich

The corky stem of a mature corky passionfruit.

Stinking passionfruit is a major weed in the north-west of Australia (Webber et al. 2014), where it overtops trees up to 14 m in height and can form mats of stems along the ground that are over 80 cm thick and contain up to 1 km of stems in 1 m². It also occurs in tropical and subtropical coastal regions of WA, NT and Qld. It has:

- shallow, rounded-lobed leaves (3 lobes)
- no glands on the leaf stalk
- hairy stems, often rusty in colour
- flowers 3–5 cm wide, white to purple
- fruit 2 cm in diameter, hairy and yellow.



Hairy fruit of stinking passionfruit.



Stinking passionfruit flower and 3-lobed leaf.

White passionfruit is widespread in coastal eastern Australia, from Rockhampton, Qld to Ulladulla, NSW; primarily growing on the margins of rainforests and other disturbed areas. It has:

- leaves with 3 deep lobes with rounded ends
- 1–3 glands along the leaf stalk and leafy stipules
- white flowers, 5 cm in diameter
- green fruit, 4 cm long.



White passionfruit flower.



Fruit and 3-lobed leaves of white passionfruit.

Other exotic *Passiflora* species include edible passionfruit (*P. edulis*), banana passionfruit (*P. tarminiana*) and crimson passionfruit (*P. morifolia*).

Chapter 6



WoNS
WEEDS OF
NATIONAL
SIGNIFICANCE

Rubber vine—*Cryptostegia grandiflora*

A woody shrub or climber that can reach 30 m into the canopy. It forms dense thickets that can damage and kill native vegetation, as well as restrict the movement of animals and people. It is mainly found in tropical northern Australia, in WA, NT and Qld. There have also been infestations found in Central and South East Qld. Rubber vine is listed as a WoNS. Best practice management methods can be found at weeds.org.au/profiles/rubber-vine-rubbervine/.

Key ID characteristics:

- oval-shaped leaves that are glossy, dark green and have reddish-purple stalks
- flowers that are trumpet shaped with 5 white to purple petals
- paired seed pods that are 12 cm long, 4 cm wide and rigid.

© C.G. Wilson 1987



Rubber vine invading and killing native vegetation.



Rubber vine flowers.

© M. Fagg 2013



Paired seed pods of rubber vine.

© M. Fagg 2004

Silverleaf desmodium—*Desmodium uncinatum*

Silverleaf desmodium is a weed of disturbed areas. In Australia it is mainly found in South East Qld and north-eastern NSW. It has a dense covering of hooked hairs on its stems, which allows it to attach to surfaces, including clothing.

Key ID characteristics:

- compound leaves with 3 leaflets, 2–10 cm long and 1–6 cm wide
- distinct silver stripe on upper surface of leaflets
- flowers clustered in spikes towards the end of stems
- seed pods slightly curved, 1–3 cm long and covered in hooked hairs.



Silverleaf desmodium trifoliolate leaves with distinct silver stripe.



Flowers of silverleaf desmodium.

Turbine vine—*Turbina corymbosa*

Turbine vine is a perennial, scrambling vine growing to at least 8 m in height. It was introduced as an ornamental plant and is becoming a serious problem in North Qld, where it establishes at rainforest margins and along waterways, displacing native vines and shrubs.

Key ID characteristics:

- heart-shaped leaves, alternately arranged
- clusters of white, tubular flowers usually with dark reddish-purple or dark brownish coloured throats
- fruit are papery, oval capsules with a short beak at end, along thin dead stems
- mature stems are woody, deeply fissured and rope like.



Turbine vine flowers.



Turbine vine leaves.



Turbine vine fruit.



Turbine vine mature twisted stems.

Sheldon Navie

Sheldon Navie

© Centre for Australian National Biodiversity Research 1998

Matt Sheehan

Chapter 6

Turkey rhubarb—*Rumex sagittatus*

Turkey rhubarb is a vigorous scrambling vine, found in coastal regions of eastern Australia. It spreads via masses of windblown seeds.

Key ID characteristics:

- arrow-shaped leaves, 6–10 cm long and 3–5 cm wide
- ribbed stems, red or green
- fruit is small and surrounded by papery wings that have a pinkish edge; large numbers of fruit can be seen during fruiting.



R.G. & F.J. Richardson

Leaf (left) and ribbed stem (right) of turkey rhubarb.



R.G. & F.J. Richardson

Turkey rhubarb fruit.

Native species

Some species of native vine can form dense thickets under the right conditions, and thus appear 'weedy'. It is important to be able to identify native vines and scramblers. They can sometimes dominate degraded sites and their impact on other plants may need to be considered in the planning stage and during restoration efforts. Some common native vine species known to reach high abundance are detailed below.

Austral sarsaparilla, lawyer vine, barbwire vine—*Smilax australis*

Austral sarsaparilla is a common semi-woody vine found around coastal Australia, in Vic, NSW, Qld, NT and north-eastern WA. It grows up to 8 m long and can be abundant with many prickly stems trailing between plants, making it very difficult to walk through dense thickets.

Key ID characteristics:

- tough leaves with five longitudinal veins
- coiled tendrils
- green prickly stems
- berries clustered in umbrella-shaped inflorescence, turning black with age.



© M. Fagg 1987

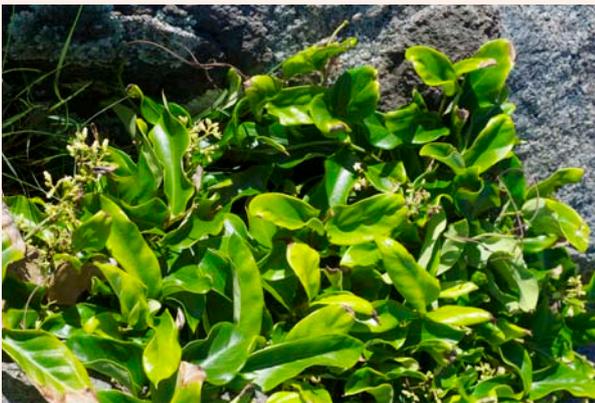
Fruit and leaves of Austral sarsaparilla.

Common silkpod—*Parsonsia straminea*

Common silkpod is a large woody vine found in NSW and Qld. It is present and abundant in many vegetation communities but is most associated with Swamp Oak Forests. It begins to climb using aerial roots, and larger individuals twine.

Key ID characteristics:

- adult leaves oval-shaped, 4–24 cm long and 2–8 cm wide; juvenile leaves 1–5 cm long with a round or heart-shaped base and a purplish colour
- fruit is a long (10–20 cm) green capsule filled with a large number of windblown seeds.



© M. Fagg 2011

Common silkpod adult leaves.



© Centre for Australian National Biodiversity Research 1998

Common silkpod fruit.

Kangaroo vine—*Cissus antarctica*

Kangaroo vine is a large woody vine that grows vigorously and has large stems often greater than 5 cm in diameter, and sometimes more than 15 cm in diameter. It is common in warmer rainforests north of Tathra in NSW, often in high abundance and biomass.

Key ID characteristics:

- leaves alternately arranged and serrated, 4–12 cm long and 2–5 cm wide
- tendrils opposite to leaves
- fruit is a purple berry, 15 mm in diameter.

Native grape—*Cayratia clematidea*

Native grape is a slender herbaceous climber up to 10 m long. It is often seen in disturbed areas such as rainforest edges, usually in high abundance. Present in coastal NSW and Qld.

Key ID characteristics:

- compound leaves (5 leaflets)
- branched tendrils opposite leaves
- fruit a small, black berry.



Kangaroo vine leaves and tendrils.



Native grape flowers and leaves.

© M. Fagg 2010

Chapter 6

Snake vine—*Stephania japonica* var. *discolor*

Snake vine is a slender twiner with woody stems. It occurs in coastal NSW and Qld, and is also present in Eastern Asia.

Key ID characteristics:

- shield-shaped leaves, almost triangular in shape
- leaf stalk attached to the underside of the leaf, not the leaf edge.



© M. Fagg 2006

Snake vine fruit and leaves.

Wonga wonga vine—*Pandorea pandorana*

Wonga wonga vine is a common native woody climber with stems as large as 10 cm in diameter. It is distributed throughout coastal NSW and inland, often in rainforests, moist areas of sclerophyll forests, as well as rocky sites.

Key ID characteristics:

- compound leaves with 3–9 leaflets
- leaflet margins entire in adult plants, though bluntly toothed and 'fern like' in juveniles
- inflorescences have white flowers often with purple blotches.



© M. Fagg 1998

Wonga wonga vine leaves and flowers.

Legal requirements to control cat's claw creeper and Madeira vine

The table below provides an overview of the declaration status and management requirements of cat's claw creeper and Madeira vine throughout Australia (as at April 2024).

State/ Territory	Legislation	Declaration	Goals/Actions
Australian Capital Territory	<i>Pest Plants and Animals Act 2005</i>	Declared Schedule 1	Both Madeira vine and cat's claw creeper are prohibited and must be suppressed. Madeira vine is a notifiable pest plant in the ACT.
New South Wales	<i>Biosecurity Act 2015</i>	Declared	<p>All of NSW: Both species must not be imported into the state, sold, bartered, exchanged or offered for sale. General biosecurity duty to ensure a biosecurity risk is prevented, eliminated or minimised, so far as is reasonably practicable. Regional strategic weed management priorities vary throughout the state for both species (see detail below).</p> <p>Cat's claw creeper regional priorities: Asset protection in Central West, Greater Sydney, Hunter and North West, eradication in the South East. Refer to Weed Wise for further detail on regional requirements: weeds.dpi.nsw.gov.au/Weeds/CatsClawCreeper</p> <p>Madeira vine regional priorities are eradication in the Central Tablelands and asset protection in the North West. Refer to Weed Wise for further detail: weeds.dpi.nsw.gov.au/Weeds/MadeiraVine</p>
Northern Territory	<i>Weeds Management Act 2001</i>	Declared Class A and C	Cat's claw creeper is a Class A (to be eradicated) and Class C (not to be introduced) weed in all parts of the Northern Territory. It is illegal to grow, sell, transport or use a declared species in the NT.
		Declared Class C	Madeira vine is a Class C weed, not to be introduced to the Territory.
Queensland	<i>Biosecurity Act 2014</i>	Declared Category 3 – restricted	Both species must not be given away, sold or released into the environment. The Act requires everyone to take all reasonable and practical steps to minimise the risks associated with invasive plants under their control. Local government biosecurity plans detail requirements at the local level.
South Australia	<i>Landscape South Australia Act 2019</i>	Declared Category 2	Both species are declared to prohibit sale and movement anywhere in South Australia. This includes the sale of nursery stock, seeds or other propagating material.
Tasmania	<i>Biosecurity Act 2019 and Biosecurity Regulations 2022</i>	Declared	The importation, sale and distribution of both species is prohibited in Tasmania. The legal responsibilities of landholders and other stakeholders in dealing with these species are laid out in the relevant Weed Management Plans. See nre.tas.gov.au/invasive-species/weeds/weeds-index/declared-weeds-index/cats-claw-creeper and nre.tas.gov.au/invasive-species/weeds/weeds-index/declared-weeds-index/madeira-vine for more information. Report any cat's claw creeper or Madeira vine plants (or suspected plants) to Biosecurity Tasmania.
Victoria	<i>Catchment and Land Protection Act 1994</i>	Declared Schedule 2	Both species are restricted weeds in the whole of the State. Restricted weeds pose an unacceptable risk of spreading and are a serious threat to another state or territory of Australia. Trade in these weeds and their propagules (either as plants, seeds or contaminants in other materials) is prohibited.
Western Australia	<i>Biosecurity and Agricultural Management Act 2007</i>	Declared C1 Prohibited – s12	Cat's claw creeper should be excluded from all of Western Australia. It may only be imported and kept subject to permits.
		Permitted – s11	Madeira vine is permitted entry for the whole of state and is currently not assigned to any control category for a local government area.

Chapter 6

Herbarium contact details

	Phone	Email	Website
ACT	(02) 6246 5084	canbr-info@anbg.gov.au	cpbr.gov.au/cpbr/herbarium
NSW	(02) 9231 8111	feedbackRrbgsyd@rbgsyd.nsw.gov.au	rbgsyd.nsw.gov.au/Science-Conservation/Herbarium
NT	(08) 8999 4516 (Darwin) (08) 8951 8791 (Alice Springs)	herbarium@nt.gov.au	nt.gov.au/environment/native-plants/native-plants-and-nt-herbarium
Qld	(07) 3199 7699	Queensland.Herbarium@qld.gov.au	qld.gov.au/environment/plants-animals/plants/herbarium
SA	(08) 8222 9311	stateherbsa@sa.gov.au	environment.sa.gov.au/topics/science/science-research/state-herbarium
Tas	(03) 6226 2635	herbarium@tmag.tas.gov.au	tmag.tas.gov.au/collections_and_research/tasmanian_herbarium
Vic	(03) 9252 2300	rbg@rbg.vic.gov.au	rbg.vic.gov.au/science/herbarium/
WA	(08) 9219 8000	herbarium@dpaw.wa.gov.au	dbca.wa.gov.au/science/research-tools-and-repositories/western-australian-herbarium

Weed control and biodiversity management contacts

	Organisation	Phone	Email	Website
National	Department of Agriculture, Fisheries and Forestry	1800 900 090	Online enquiry: agriculture.gov.au/about/ contact/online-enquiry	agriculture.gov.au/biosecurity-trade/ pests-diseases-weeds/weeds
	Department of Climate Change, Energy, the Environment and Water	1800 920 528	Online enquiry: dcceew.gov.au/about/ contact	dcceew.gov.au/environment/invasive-species
	Weeds Australia	–	–	weeds.org.au
ACT	Environment, Planning and Sustainable Development Directorate – Environment	13 22 81	ACTBiosecurity@act.gov.au	environment.act.gov.au/parks-conservation/plants-and-animals/biosecurity/invasive-plants
NSW	Department of Primary Industries and Regional Development	1800 680 244	weeds@dpi.nsw.gov.au	dpi.nsw.gov.au/biosecurity/weeds
	Department of Climate Change, Energy, the Environment and Water - Environment and Heritage	(02) 9995 5000	info@environment.nsw.gov.au	environment.nsw.gov.au/topics/animals-and-plants
	Local Land Services	1300 795 299	lls.nsw.gov.au/i-want-to/ contact-my-local-office/ online-customer-inquiry-form	lls.nsw.gov.au
NT	Department of Lands, Planning and Environment	(08) 8999 4567	weedinfo@nt.gov.au	nt.gov.au/environment/weeds nt.gov.au/environment/native-plants
Qld	Department of Primary Industries	13 25 23	info@daf.qld.gov.au	daf.qld.gov.au/business-priorities/ biosecurity/invasive-plants-animals/ plants-weeds
	Department of the Environment, Tourism, Science and Innovation	13 74 68	desi.qld.gov.au/contactus/ feedback-forms/feedback-form-enquiry	environment.desi.qld.gov.au/
	NRM Regions Queensland	0419 790 943	admin@nrmrq.org.au	nrmrq.org.au/
	Local Government Association of Queensland	1300 542 700	ask@lgaq.asn.au	lgaq.asn.au

Table continued on next page/...

Chapter 6

	Organisation	Phone	Email	Website
SA	Department of Primary Industries and Regions	(08) 8303 9620	invasivespecies@sa.gov.au	pir.sa.gov.au/biosecurity/weeds
	Department for Environment and Water	(08) 8204 1910	environment.sa.gov.au/contact-us	environment.sa.gov.au/
	Landscape SA	Search the website for contact details of your local Landscape Board		landscape.sa.gov.au/
Tas	Department of Natural Resources and Environment Tasmania	1300 368 550	Biosecurity.Tasmania@nre.tas.gov.au	nre.tas.gov.au/invasive-species/weeds nre.tas.gov.au/environment
Vic	Agriculture Victoria	13 61 86	Refer to: agriculture.vic.gov.au/about/contact-us	agriculture.vic.gov.au/biosecurity/weeds/weeds-information
	Department of Energy, Environment and Climate Action		deeca.vic.gov.au/our-department/contact-us	deeca.vic.gov.au
WA	Department of Primary Industries and Regional Development	1300 374 731	enquiries@dpird.wa.gov.au	agric.wa.gov.au/pests-weeds-diseases/weeds
	Department of Biodiversity, Conservation and Attractions	(08) 9219 9000	dbca.wa.gov.au/contact	dbca.wa.gov.au

Herbicide use, training and certification

Table 6.1 Herbicides registered for use on cat's claw creeper  and Madeira vine .

Application method	Active ingredient	Commercial product	Rate	Situation	State or territory	Comments
Stem injection  	Aminopyralid + picloram (4.47 + 44.7 g/L) ⁴ gel product	Vigilant® II gel	Immediately apply a 3–5 mm layer	Non-crop areas, including native vegetation, conservation areas, gullies, reserves and parks	All	Large plants: Cut a series of blazes 15–20 mm deep around main trunks of the tree using an axe or pruning saw. Blazes should be evenly spaced with no more than a 20–40 mm gap between blazes. Use and squeeze the brush-bottle, as the applicator, to apply a 5 mm layer of Vigilant® II over the lower cut surface of the blaze.
Cut stump  						Small plants: Cut stems horizontally 20 mm, and preferably no higher than 100 mm, above ground level. Use and squeeze the brush-bottle, as the applicator, to apply a 3–5 mm thick layer of Vigilant® II over the cut surface remaining on the plant. On stems of 20 mm diameter or greater, use and squeeze the brush-bottle, as the applicator, to apply a 5 mm thick layer of gel. In the case of multi-stem plants, treat at least 80% of stems including all main stems. Picloram and aminopyralid can remain active in the soil for extended periods depending on rate of application, soil type (clay content), rainfall, temperature, humidity, soil moisture and soil organic matter. Following application of this product, the localised regeneration or establishment of sensitive species may be adversely affected by soil residues.
Basal bark 	Fluroxypyr (333 g a.i./L) ²	Starane® Advanced Herbicide	2.1 L/100 L diesel or Biosafe only	Agricultural non-crop areas, commercial & industrial areas, forests (including softwood plantations), pastures and rights of way	All	Always treat vines away from the host tree as injury to the host tree may occur.
Foliar 			300 mL/100 L water high volume			

Chapter 6

Table 6.2 Herbicides permitted for use on cat's claw creeper and Madeira vine.

Permit holder	Situation	Active ingredient	Commercial products ¹	Rate	Application	Comments
<p>Permit PER13914 Control of Madeira vine and cat's claw creeper in riparian zones. Expires 31 March 2026. NSW & Queensland only. Can be used by persons generally.</p> 						
NSW Department of Primary Industries	Riparian zones	Triclopyr + picloram (300 + 100 g/L) ⁴	Nufarm Conqueror®	400 mL/100 L water	Foliar spray	<p>Apply by high volume handgun to vines on the ground.</p> <p>Cat's claw creeper is difficult to detach so juvenile vines attached to the host can be sprayed with the mixture providing no spray comes into contact with the hosts' leaves.</p> <p>Spraying may be required once per year for cat's claw creeper and up to three times per year for Madeira vine.</p> <p>DO NOT use within 5 m of a waterway.</p> <p>DO NOT use the product near desirable vegetation.</p> <p>DO NOT allow spray to drift onto non-target species and sensitive areas including, but not limited to, natural streams, rivers, wetlands or waterways.</p> <p>Minimise spray drift using very coarse to coarse droplets by reducing pressure to 500 kPa (approx. 5 Bar) and using large nozzle plates in the handgun.</p>
		Triclopyr + picloram + aminopyralid (300 + 100 + 8 g/L) ³	Grazon® Extra Herbicide			

Permit holder	Situation	Active ingredient	Commercial products ¹	Rate	Application	Comments
<p>Permit PER9907 Control of environmental and noxious weeds in areas of native vegetation, non-crop areas and public open spaces.* Expires 31 March 2025. NSW & ACT only. Can be used by persons generally.</p> 						
NSW Office of Environment & Heritage	Forests including native vegetation areas, bushland reserve areas, national park areas and non-cropland (including rights of way, commercial and industrial areas, domestic and urban areas, public service areas and botanic gardens)	Glyphosate (360 g/L) only	Weedmaster® Duo	1:1.5 with water to undiluted herbicide	Cut stump, basal bark spray or cut/scrape and paint	Follow the label. Re-apply according to rate of weed growth and re-infestation. These herbicides have no residual soil activity when used at label rates.
		Glyphosate 360 g a.i./L + metsulfuron-methyl 600 g a.i./kg	Weedmaster® Duo and Brush-Off®	Tank mixes of 1:1.5 glyphosate + 1 g metsulfuron-methyl per 1 L water	Cut-and-paint	
		Fluroxypyr (333 g a.i./L)	Starane® Advanced Herbicide	21 mL per 1 L diesel/kerosene	Basal bark spray	
		Fluroxypyr (200 g a.i./L)	Nufarm Comet 200 Herbicide	35 mL per 1 L diesel/kerosene	Basal bark spray	
		Fluroxypyr (333 g a.i./L)	Starane® Advanced Herbicide	300–600 mL per 100 L water; or 3–6 L/ha; or label rate for specific weed	Spot spray	
		Metsulfuron-methyl 600 g a.i./kg	Brush-Off®	10–20 g per 100 L water plus surfactant	Spot spray	

Chapter 6

Permit holder	Situation	Active ingredient	Commercial products ¹	Rate	Application	Comments
<p>Permit PER11916 Control of various weeds in urban bushland, forests and coastal areas. Expires 31 March 2025. NSW only. Can be used by persons generally.</p> 						
NSW Department of Primary Industries	Urban bushland Forests Coastal reserves	Glyphosate (360 g/L) only Approved for use in aquatic areas only	Weedmaster® Duo	1:50 water surfactant	Spray seedlings	For the control of weeds at coastal reserves only, registered products that are approved for use in aquatic areas may be used.
				1:1.5 with water	Cut stump/ scrape stem/inject	
				1:100 water + surfactant	Spray (to kill regrowth)	
				Undiluted	Cut stump/ scrape stem/ inject	
<p>Permit PER14249 Control of various environmental weeds in national parks and nature reserves. Expires 31 March 2025. NSW & ACT only. Used only by staff or contractors employed/contracted by NSW Department of Planning, Industry and Environment and agencies/organisations represented on NSW Regional Weed Committees and staff or contractors employed by the ACT Government, who are qualified and experienced in the handling and use of agricultural chemicals.</p> 						
NSW National Parks & Wildlife Service	Areas of native vegetation and non-cropland areas	Triclopyr + picloram (300 + 100 g/L) ³ Triclopyr + picloram + aminopyralid (300 + 100 + 8 g/L) ³	Nufarm Conqueror® Grazon® Extra Herbicide	250 to 500 mL / 100 L water	Spray thoroughly	A maximum number of three applications per year is permitted with a minimum re-treatment interval of 60 days between consecutive applications. Apply to the foliage of target species via knapsack or handgun. Use higher rates for larger plants. Apply to plants less than 1.5 m tall. Apply from October to May unless stated otherwise.

Permit holder	Situation	Active ingredient	Commercial products ¹	Rate	Application	Comments
Permit PER11463 Control of environmental weeds in non-crop areas. Expires 30 April 2027. Queensland only. Can be used by persons generally.						
						
Biosecurity Queensland	Non-agricultural areas, domestic and public service areas, commercial and industrial areas, bushland/ native forests, roadsides, rights of way, vacant lots, wastelands, wetlands, dunal and coastal areas	2,4-D 300 g/L ²	Conquest Amine 300 Selective Herbicide	Up to 95 mL / 15 L water or up to 625 mL / 100 L water or up to 6.25 L/ha	Spot spray	Refer to product label for critical use comments.
		2,4-D 300 g/L + picloram 75 g/L	Tordon 75-D Herbicide	Up to 150 mL / 15 L water or up to 1 L / 100 L water	Spot spray	Apply using a minimum of 1500 L/ha water. Use a wetting agent as per label instructions for non-crop situations. Consult label for critical use comments.
		Dicamba 500 g/L	Kamba 500 Selective Herbicide	Up to 130 mL / 15 L water or up to 600 mL / 100 L water or up to 8.8 L/ha	Spot spray	Apply using a minimum of 1500 L/ha water. Use a wetting agent as per label instructions for non-crop situations. Consult label for critical use comments.
		Diesel	N/A	Sufficient amount as required to treat target weeds	Paint or spot spray crowns	
		MCPA 500 g/L	Nufarm MCPA 500 Selective Herbicide	75–150 mL / 15 L water or 500 mL–1 L / 100 L water or 5–10 L/ha	Spot spray	Add a wetting agent as per label instructions.
		Triclopyr 200 g/L + picloram 100 g/L + aminopyralld 25 g/L OR Triclopyr 200 g/L + picloram 100 g/L	Tordon Regrowth Master Herbicide OR Apparent Slogger Herbicide	75 mL / 15 L water or 500 mL / 100 L water 1 L / 4 L water 750 mL / 15 L water	Spot spray Drill, frill, axe or stem injection Cut stump	Spot spray where residual weed control is required away from waterways. Cut stumps to less than 10 cm above the ground and immediately paint stump after cutting OR spot spray cut stump.

Biosecurity Queensland continued on next page/...

Chapter 6

Permit holder	Situation	Active ingredient	Commercial products ¹	Rate	Application	Comments
Biosecurity Queensland continued/...	(see previous page)	Triclopyr 240 g/L + picloram 120 g/L	Access	250 mL per 15 L in diesel or other suitable carrier as per product label general instructions	Cut stump Basal bark	Either paint stump immediately after cutting OR paint OR spray basal bark.
				1 L per 10 L diesel.	Basal bark	Thinline application method: Spray the bark around the stem from ground level up to 5 cm high. Refer to product label for further instruction.
		Triclopyr 300 g/L + picloram 100 g/L + aminopyralid 8 g/L OR Triclopyr 300 g/L + picloram 100 g/L	Grazon Extra OR Conquerer	53–75 mL / 15 L water or 350–500 mL / 100 L water	Spot spray	Spot spraying where residual weed control is required. Add a wetting agent or spray oil according to label instructions.
				350–500 mL / 10 L water plus wetting agent	Foliar application	Low volume / high concentration application; e.g. Drench, splatter gun, sprinkler sprayer or gas-powered gun. Refer to product label for appropriate wetter. Read product label thoroughly.
		Triclopyr 600 g/L ³	Garlon 600	50 mL / 15L water or 330 mL / 100 L water	Spot spray	
				17 mL per 1 L diesel, kerosene OR Biosafe	Basal bark Cut stump	
		Glyphosate 360 g/L	Roundup	10 mL/L	Spot spray	Apply to healthy, actively growing vines only. Apply as a foliar application, up to twice a year. Apply only when supporting plant and understory is dead. Apply early autumn (March–April). Do not spray beyond point of run off.
					1 part product to 2 parts water (e.g. 10 mL in 20 mL water)	Cut stump

Permit holder	Situation	Active ingredient	Commercial products ¹	Rate	Application	Comments
<p>Permit PER82307 Control of environmental and declared noxious weeds in areas of native vegetation, bushland reserves and revegetation areas, non-crop areas and open public spaces. Expires 31 August 2027. Queensland only. Can be used by persons generally.</p> 						
Council of the City of Gold Coast	Forests including native vegetation areas, bushland reserves, revegetation areas, national park areas and non-cropland (including rights of way open spaces commercial and industrial areas domestic and urban areas public service areas and botanic gardens)	Glyphosate (360 g a.i./L)	Weedmaster® Duo OR Roundup bioactive	1:1.5 with water to undiluted herbicide	Cut stump; cut, scrape and paint; scrape and paint	Re-apply according to rate of weed growth and re-infestation. Only products registered for use in aquatic situations may be used in aquatic situations under this permit.
		Glyphosate (360 g a.i./L) + metsulfuron-methyl (600 g a.i./kg)	Weedmaster® Duo + Associate®	Tank mixes of 1:1.5 glyphosate + 1 g metsulfuron-methyl per 1 L water		
<p>Permit PER87321 Control of Madeira vine in non-agricultural bushland/natural ecosystems. Expires 31 May 2025. NSW only. Council officers, contractors or bushcare volunteers acting under the direction of a NSW local government council only.</p> 						
City of Parramatta Council	Bushland / natural ecosystems (non-agricultural)	Glyphosate (360 g/L) only	Weedmaster® Duo	1:1 with water	Cut and immerse stem for prolonged herbicide uptake	Sever primary feeder stems near ground line and insert the cut stem into a labelled and dedicated receptacle containing a mixture of glyphosate 360 g/L herbicide and water in the ratio of 1:1. This herbicide receptacle is placed inside a secured, chained and locked storage box. The receptacle should be monitored and replenished with herbicide solution on an as-needed basis, which is dependent on plant uptake – this usually lasts for 7 days when the solution is no longer taken up from the container. DO NOT make more than one (1) application.

Chapter 6

Permit holder	Situation	Active ingredient	Commercial products ¹	Rate	Application	Comments
Permit PER10533 Control cat's claw creeper in pasture and non-crop situations. Expires 21 July 2028. Queensland only. Can be used by persons generally.						
						
Biosecurity Queensland	Pastures and non-crop situations	Glyphosate (360 g/L) only	Weedmaster® Duo	83 mL/1 L water	Cut stump	Ensure vines are actively growing at time of treatment and not under stress of drought, waterlogging or cold conditions. Cut vine close to ground and immediately wet stump surface thoroughly using splatter gun, spray, swab or brush. Remove any branches on the stump and treat any cut surface.
		Dicamba (500 g/L) only	Kamba® 500 Selective Herbicide	33 mL/1 L water		
		Glyphosate (360 g/L) only	Weedmaster® Duo	10 mL/1 L water	Foliar spray	Ensure vines are actively growing at time of treatment and not under stress of drought, waterlogging or cold conditions. Apply to vines up to 2 m in height by high volume application using calibrated knapsack or handgun. Spray to wet foliage ensuring complete coverage over top of growing terminals.
		Dicamba (500 g/L) only	Kamba® 500 Selective Herbicide	4 mL/1 L water		

¹ Commercial products listed here are examples only; visit apvma.gov.au.

² Products containing different concentrations of the active ingredients are registered for this use; for example, products containing the active fluroxypyr are available at 200, 333 and 400 g/L concentrations. Check the permit/label for rates.

³ Picloram and aminopyralid remain active in soil for extended periods and may leach into groundwater. Avoid high application rates where possible.

* When interpreting permits for declared or environmental weeds only, refer to 'vines' in the weed column of the tables when determining herbicide and rate.

NOTE: Not all currently registered herbicides are commercially available. Check the company website for a current label.

NOTE: Herbicides are not to be used for any purpose or in any manner contrary to the label unless authorised under appropriate legislation. By law, you must read the label (or have it read to you) before using any herbicide product. The same applies for minor use permits. Always follow the label and permit directions.

Using herbicides legally, safely and effectively

SAFE USE OF HERBICIDES FACTSHEET

Herbicide labels and legislation

The Australian Pesticides and Veterinary Medicines Authority (APVMA) regulates the availability of all pesticides, including herbicides. Herbicides are registered with the APVMA for specific applications as stated on the label, and state or territory governments regulate the use of herbicides after sale. A herbicide label is a legal document that defines where, when and how a herbicide may be used, on which weed species and at what rate. This is referred to as 'on label' use.

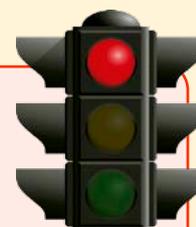
By law, you must read the label (or have it read to you) before using any herbicide product.

Table 6.1 provides information on herbicides registered for use on cat's claw creeper and Madeira vine (current at time of publication).

Off-label use

Off-label use is the use of a registered chemical to address a specific issue that is not covered by an APVMA-approved label or permit, such as to control a different weed, to protect a different host (such as a crop) or to apply at a different rate or frequency.

Off-label use is permitted in all states and territories; however, conditions vary in each jurisdiction. For more information and advice, refer to Chapter 6 for state and territory government contact details.



Warning!

Off-label practices DO NOT exclude or override product maximum residue limits, work health and safety or environmental safety.

If intending to use the product off-label, the user must consider the rate of pesticide, the time and frequency of application, the likelihood of residues and the potential for worker exposure.

'Off-label use' does not override Directions for Use 'DO NOT' statements on labels and permits, such as 'DO NOT use in the urban home garden' or 'DO NOT use if rain is likely to fall within 12 hours of application'.

The pesticide manufacturer is not liable for off-label use of its product.

Minor use and emergency use permits

The APVMA may issue minor use and emergency use permits for herbicide applications that are not otherwise registered for that particular use. Minor use permits can also be referred to as 'off-label' permits. Minor use and emergency permits are valid ('in force') for a limited time. See the APVMA website to find current permits.

Chapter 6

Some states/territories also have permits for declared weed control but may not specifically list the weed species to be controlled. These permits will often list a range of herbicides that can be used for declared or environmental weed control.

Table 6.2 provides a summary of permits for use on cat's claw creeper and Madeira vine (current at time of publication).

To find current permits for your state/territory go to:

- the APVMA permits search
- enter 'declared weeds' or 'environmental weeds' in the 'key words' box
- click the search term 'Pest/purpose'
- click 'Search'.

If you are unsure which herbicides can legally be used on a particular weed in your state/territory, contact the relevant section of your agriculture department (refer to the 'Herbicides and the law' contacts section of this chapter).

Safe use of herbicides

Take care to minimise off-target herbicide damage to desired plants and animals, the environment, yourself and other workers.

Operator safety

Herbicide labels will indicate the personal protective equipment (PPE) required for operator safety. This may include:

- impervious gloves
- eye protection
- respirator (with a filter appropriate to the level of herbicide toxicity)
- clothes, hat and boots that cover the whole body.

For herbicides with a higher risk to operator safety, additional PPE and precautions may apply, including wearing a full-face respirator and chemical-resistant overalls.



NESP Resilient Landscapes Hub

Always follow the herbicide label requirements and consult the Safety Data Sheet on the health risks of exposure and PPE recommendations.

Withholding periods

Certain herbicides have withholding periods, during which livestock must be excluded from grazing treated areas, and cutting pastures for hay or silage should be avoided. Do not introduce stock within the withholding period stipulated by the product label.

Environmental protection

Herbicide labels provide the mandatory measures an operator should adopt to protect the environment and non-target plants during product use. This may include instructions for preventing spray drift.

Herbicide users have a legal obligation to avoid spray drift damage and to ensure that the applied chemical stays within the target area. This is to avoid 'off-target' impacts to crops, native vegetation and other plants, and 'chemical trespass' onto neighbouring properties.

Measures to reduce the risk of spray drift include:

- spraying when the wind is 3–15 km per hour, or when no surface temperature inversion conditions exist
- using a coarse to very coarse spray quality nozzle type
- avoiding the use of high pump/sprayer pressures that create small droplets that float in the air
- having buffer zones.

Using herbicides near water

Riparian zones are sensitive habitats and therefore a licence may be required to conduct weed control works within these zones. Use only herbicides that are registered or permitted for use in and around aquatic areas; some are formulated to be lower risk when used near water, for example, Roundup® Biactive. Never:

- spray herbicides over waterbodies or plants standing in water
- add adjuvants to herbicides to be used near water.

Chemical use training and certification

Chemical use training is required for people using herbicides as part of their job or business. Training is also recommended for community groups and may be required if working on public land. Commercial weed control operators need to be licenced in most states/territories.

Effective use of herbicides

Successful herbicide control is dependent on:

- selecting the right herbicide for the target species
- the growth stage of the target species
- the weather conditions during and after spraying

- how thoroughly the herbicide is applied
- the herbicide mix and application rate.

For spraying, wind speeds should be low (<15 km/h but above 3 km/h), and no rain should be expected in the following six hours.

Do not apply herbicide to plants that are under any sort of stress because it will not be absorbed and translocated effectively, resulting in a reduced level of control. Plants may be stressed owing to:

- dry soil
- low humidity
- air temperatures above 30°C
- frost
- waterlogged soils.

Herbicide effectiveness can be maximised by:

- mixing it with dye to help minimise missed areas and prevent overspraying (double spraying). Similarly, a foam marker or GPS can be used to indicate the edges of boom spraying.
- using an adjuvant – an additive that improves herbicide uptake
- ensuring spray equipment is correctly calibrated and maintained, including by thoroughly cleaning it between uses.

If an adjuvant is used, always read the product label to ensure it is compatible with the herbicide and there are no restrictions on its use; for example, adjuvants should not be used near waterways.

Where to get help

Refer to details found within this chapter for more information on contacts, chemical use training and certification.

Chapter 6

Herbicide Treatment Record Sheet				
Contractor		Date/Time		
Operator Names		Property/GPS Location		
Area Description (landmarks, etc.)				
Growth Stage (✓)				
Target Species	Seedling	Juvenile	Flowering	Fruiting
1				
2				
3				
Plant Growth/Comments (✓)				
Target Species	Active Growth	No Active Growth	Under Stress (comments)	
1				
2				
3				
Environmental Conditions				
Soil Conditions (circle)		Dry	Damp	Wet
Rainfall – Previous 12hrs (Y/N)				
None expected in next 12hrs (Y/N)				
Wind Direction				
Wind Speed				
Temperature				
Application Method (circle)				
Foliar Spray	Cut & Swab	Scrape & Paint	Other	
Operator signature		Project Officer signature		

Herbicides and the law

In addition to the regulatory role of the Australian Pesticides and Veterinary Medicines Authority, herbicide use is regulated by state and territory legislation; see below for contact details.

	Department	Phone	Email	Website
National	Australian Pesticides and Veterinary Medicines Authority (APVMA)	02 6770 2300	enquiries@apvma.gov.au	apvma.gov.au
ACT	Environment, Planning and Sustainable Development Directorate – Environment	13 22 81	environment.protection@act.gov.au	ablis.business.gov.au/service/act/agvet-code-of-the-australian-capital-territory/3650
NSW	NSW Environment Protection Authority (EPA)	131 555	info@epa.nsw.gov.au	epa.nsw.gov.au/your-environment/pesticides/pesticides-nsw-overview/regulating-pesticides-nsw
NT	Department of Industry, Tourism and Trade	08 8999 2344	chemicals@nt.gov.au	nt.gov.au/industry/agriculture/farm-management/using-chemicals-responsibly
Qld	Business Queensland	13 74 68	qld.gov.au/contact-us	business.qld.gov.au/industries/farms-fishing-forestry/agriculture/sustainable/chemical
SA	Department of Primary Industries and Regions	1300 799 684	PIRSA.RuralChemicals@sa.gov.au	pir.sa.gov.au/biosecurity/rural_chemicals
Tas	Department of Natural Resources and Environment Tasmania	03 6777 2133	Stuart.Bowman@nre.tas.gov.au	nre.tas.gov.au/agriculture/agvet-chemicals
Vic	Department of Energy, Environment and Climate Action	136 186	agriculture.vic.gov.au/about/contact-us	agriculture.vic.gov.au/farm-management/chemicals
WA	Department of Primary Industries and Regional Development	1300 374 731	enquiries@dpird.wa.gov.au	agric.wa.gov.au/pests-weeds-diseases/control-methods/chemicals

Chemical use training

A number of providers offer accredited training in the use of chemicals for weed control. To find a provider near you, visit the following website and search for the code AHCPMG301 under the 'NRT' search function. Follow the link to find Registered Training Organisations (RTOs) approved to deliver this training package: training.gov.au/Search.

Chapter 6

Safety and welfare

A risk management tool called Running the Risk? is available from Volunteering Australia at volunteeringaustralia.org/wp-content/files_mf/1377053059VAManagersrunningtherisk.pdf

Further information on safety and welfare policy, standards, guidelines and legislation can be accessed by contacting the following government departments and volunteer organisations.

	Website	Contact
National	safeworkaustralia.gov.au	info@swa.gov.au
	volunteeringaustralia.org	03 9820 4100 volaus@volunteeringaustralia.org
ACT	worksafe.act.gov.au/Home	13 22 81 worksafe@worksafe.act.gov.au
NSW	safework.nsw.gov.au	13 10 50
NT	worksafe.nt.gov.au/home	1800 019 111 ntworksafe@nt.gov.au
Qld	worksafe.qld.gov.au	1300 362 128 worksafe.qld.gov.au/contact/general-enquiries
SA	safework.sa.gov.au	1300 365 255 help.safework@sa.gov.au
Tas	worksafe.tas.gov.au	1300 366 322 wstinfo@justice.tas.gov.au
Vic	worksafe.vic.gov.au	1800 136 089 myworksafe.vic.gov.au/s/customer-enquiry
WA	commerce.wa.gov.au/WorkSafe	1300 307 877 wscallcentre@dmirs.wa.gov.au

Site restoration

The Society of Ecological Restoration Australasia (SERA) has drafted national standards for ecological restoration (see seraustralasia.com/standards/NationalStandards2_2.pdf). These standards can be used as a best practice guide to strive for ecological restoration.

Florabank.org.au publish best practice guidelines, along with free short courses, on sourcing, collecting and propagating seeds for restoration projects.

The Australian Association of Bush Regenerators is a member-based organisation that promotes the practice of restoration. A range of resources can be found on their website (see aabr.org.au).

References

- Atlas of Living Australia. (2022). *Abrus precatorius* subsp. *africanus*. Occurrence records. https://biocache.ala.org.au/occurrences/search?q=lsid:https://id.biodiversity.org.au/node/apni/2916143#tab_mapView
- Australian Plant Society (APS) NSW. (2020). Vines and scramblers. <https://resources.austplants.com.au/plant-database/climbers/>
- Bari, I. N., Kato-Noguchi, H., Iwasaki, A., & Suenaga, K. (2019). Allelopathic potency and an active substance from *Anredera cordifolia* (Tenore) Steenis. *Plants*, 8(5), 134. <https://doi.org/10.3390/plants8050134>
- Batianoff, G. N., & Butler, D. W. (2002). Assessment of invasive naturalized plants in south-east Queensland. *Plant Protection Quarterly*, 17(1), 27-34.
- Batianoff, G. N., & Butler, D. W. (2003). Impact assessment and analysis of sixty-six priority invasive weeds in south-east Queensland. *Plant Protection Quarterly*, 18, 11-17.
- Bernich, A., French, K. & Bedward, M. (2024). Assessing the invasion potential of five common exotic vine species in temperate Australian rainforests. *NeoBiota* 90. 79-96. 10.3897/neobiota.90.110659.
- Blood, K., James, R., Panetta, F. D., Sheehan, M., Adair, R., & Gold, B. (2019). Early invader manual: Managing early invader environmental weeds in Victoria. Victorian Department of Environment, Land, Water and Planning.
- Boyne, R. L., Osunkoya, O. O., & Scharaschkin, T. (2013). Variation in leaf structure of the invasive Madeira vine (*Anredera cordifolia*, Basellaceae) at different light levels. *Australian Journal of Botany*, 61(5), 412-417. doi.org/10.1071/BT13083
- Brisbane City Council. (n.d.). Weed identification tool – Blue thunbergia. <https://weeds.brisbane.qld.gov.au/weeds/blue-thunbergia>
- Buru, J. C., Dhileepan, K., Osunkoya, O. O., & Scharaschkin, T. (2014). Seed germination may explain differences in invasiveness and prevalence: A case study using cat's claw creeper (*Dolichandra unguis-cati*). In M. Baker (Ed.), *Proceedings of the 19th Australasian Weeds Conference (2014): Science, Community and Food Security: The Weed Challenge* (pp. 223-226). Tasmanian Weed Society.
- Coutts-Smith, A., & Downey, P. O. (2006). Impact of weeds on threatened biodiversity in New South Wales [CRC for Australian Weed Management Technical Series]. Pest Management Unit, Parks and Wildlife Division, NSW Department of Environment and Conservation.
- Csurhes, B. S., & Edwards, R. (1998). Potential environmental weeds in Australia: Candidate species for preventative control. Queensland Department of Natural Resources.
- da Silva, P., Coeti, J., Ferrari, A., Melo, K., Dias, R., Schedenfeldt, B., Monquero, P., Salmazo, P., Medeiros, E., Bicalho, C., & Mauad, M. (2023). Management strategies for *Anredera cordifolia* in coffee culture. *Revista Brasileira de Engenharia Agrícola e Ambiental*, 27, 585-592. 10.1590/1807-1929/agriambi.v27n8p585-592
- Department of Agriculture and Fisheries (DAF) (2023). Cat's claw creeper fact sheet. Queensland Government. www.publications.qld.gov.au/ckan-publications-attachments-prod/resources/3b1dfe71-8d68-409a-a2ad-a9e2739432c0/cats-claw-creeper.pdf?ETag=0167385ad2e69f2c7f0b664fd76697e1
- Department of Environment, Science and Innovation (DESI) (2013). *Oakview National Park management statement 2013*, DESI, Queensland Government. https://parks.desi.qld.gov.au/__data/assets/pdf_file/0031/165694/oakview.pdf
- Dhileepan, K., Snow, E. L., Shi, B., Gray, B., Jackson, K., & Senaratne, W. K. A. D. (2021). Establishment of the biological control agent *Hypocsmia pyrochroma* for

Chapter 6

- Dolichandra unguis-cati* (Bignoniaceae) is limited by microclimate. *Journal of Applied Entomology*, 145(9), 890-899. <https://doi.org/10.1111/jen.12901>
- Dhileepan, K., Taylor, D. B. J., Treviño, M., & Lockett, C. J. (2013). Cat's claw creeper leaf-mining beetle *Hylaeogena jureceki* Obenberger (Coleoptera: Buprestidae), a host specific biological control agent for *Dolichandra unguis-cati* (Bignoniaceae). *Australian Journal of Entomology*, 52(2), 175-181.
- Dhileepan, K., Treviño, M., Bayliss, D., Saunders, M., Shortus, M., McCarthy, J., Snow, E. L., & Walter, G. H. (2010). Introduction and establishment of *Carvalhotingis visenda* (Hemiptera: Tingidae) as a biological control agent for cat's claw creeper *Macfadyena unguis-cati* (Bignoniaceae) in Australia. *Biological Control*, 55, 58-62. doi.org/10.1016/j.biocontrol.2010.06.016
- Doak, A., & Deveze, M. (2004). *Rubber vine management: Control methods and case studies*. <https://www.environment.gov.au/biodiversity/invasive/weeds/publications/guidelines/wons/pubs/c-grandiflora.pdf>
- Downey, P. O., Scanlan, T. J., & Hosking, J. (2010). Prioritising alien plant species based on their ability to impact on biodiversity: A case study from New South Wales. *Plant Protection Quarterly*, 25, 111-126.
- Downey, P. O., & Turnbull, I. (2007). The biology of Australian weeds 48. *Macfadyena unguis-cati* (L.) A.H. Gentry. *Plant Protection Quarterly*, 22, 82-91.
- Ernst, C. M., & Cappuccino, N. (2005). The effect of an invasive alien vine, *Vincetoxicum rossicum* (Asclepiadaceae), on arthropod populations in Ontario old fields. *Biological Invasions*, 7, 417-425. doi.org/10.1007/s10530-004-4062-4
- Estrada-Villegas, S., & Schnitzer, S. A. (2018). A comprehensive synthesis of liana removal experiments in tropical forests. *Biotropica*, 50, 729-739. doi.org/10.1111/btp.12571
- French, K., Robinson, S., Smith, L., & Watts, E. (2017). Facilitation, competition and parasitic facilitation amongst invasive and native liana seedlings and a native tree seedling. *NeoBiota*, 36, 17-38. doi.org/10.3897/neobiota.36.13842
- Gallagher, R. V., Hughes, L., Leishman, M. R., & Wilson, P. D. (2010). Predicted impact of exotic vines on an endangered ecological community under future climate change. *Biological Invasions*, 12, 4049-4063. doi.org/10.1007/s10530-010-9814-8
- Global Invasive Species Database (GISD). (2024). 100 of the world's worst invasive alien species. http://www.iucngisd.org/gisd/100_worst.php
- Grice, A. C., & Setter, M. J. (2003). *Weeds of Rainforests and Associated Ecosystems*. Cooperative Research Centre for Tropical Rainforest Ecology and Management.
- Harden, G. J., Fox, M. D., & Fox, B. J. (2004). Monitoring and assessment of restoration of a rainforest remnant at Wingham Brush, NSW. *Austral Ecology*, 29, 489-507. doi.org/10.1111/j.1442-9993.2004.01421.x
- Harvey, K. J., McConnachie, A. J., Sullivan, P., Holtkamp, R., & Officer, D. (2021). *Biological control of weeds: A practitioner's guide for south-east Australia*. New South Wales Department of Primary Industries.
- Harris, C. J., Murray, B. R., Hose, G. C., & Hamilton, M. A. (2007). Introduction history and invasion success in exotic vines introduced to Australia. *Diversity and Distributions*, 13, 467-475. doi.org/10.1111/j.1472-4642.2007.00375.x
- Holm, L. G., Pancho, J. V., Herberger, J. P., & Plucknett, D. L. (1991). *A geographical atlas of world weeds*. Krieger Publishing Company.
- Johnson, K. (2011a). *Weed management guide – Madeira vine (Anredera cordifolia)*. Queensland Department of Agriculture, Fisheries and Forestry.

- Johnson, K. (2011b). *Weed management guide – Cat’s claw creeper* (*Dolichandra unguis-cati*). Queensland Department of Agriculture, Fisheries and Forestry.
- King, A. M., Williams, H. E., & Madire, L. G. (2011). Biological control of cat’s claw creeper, *Macfadyena unguis-cati* (L.) AH Gentry (Bignoniaceae), in South Africa. *African Entomology*, 19(1), 366-377.
- Langeland, K. A., & Burks, K. C. (1998). *Identification and biology of non-native plants in Florida’s natural areas* [Institute of Food and Agricultural Sciences Publication SP 257]. University of Florida.
- Leishman, M., & Thomson, V. (2005). Experimental evidence for the effects of additional water, nutrients and physical disturbance on invasive plants in low fertility Hawkesbury Sandstone soils, Sydney, Australia. *Journal of Ecology*, 93, 38-49.
- Lindgren, C. J., Castro, K. L., Coiner, H. A., Nurse, R. E., & Darbyshire, S. J. (2013). The biology of invasive alien plants in Canada. 12. *Pueraria montana* var. *lobata* (Willd.) Sanjappa & Predeep. *Canadian Journal of Plant Science*, 93, 71-95. doi.org/10.4141/CJPS2012-128
- NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW). (2024). *High ecological value waterway and water dependent ecosystems – South Coast catchments of NSW* [Dataset]. <https://datasets.seed.nsw.gov.au/dataset/south-coast-catchments>
- NSW Department of Primary Industries. (2023). Madeira vine control. <https://weeds.dpi.nsw.gov.au/Weeds/MadeiraVine#control>
- NSW Scientific Committee. (2006). *Invasion and establishment of exotic vines and scramblers – key threatening process listing*. [www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-](http://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/final-determinations/2004-2007/invasion-and-establishment-of-exotic-vines-and-scramblers-key-threatening-process-listing)
- determinations/2004-2007/invasion-and-establishment-of-exotic-vines-and-scramblers-key-threatening-process-listing
- Office of Environment and Heritage (OEH). (2013). *Asparagus weeds management manual: Current management and control options for asparagus weeds (Asparagus spp.) in Australia*. <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Pests-and-weeds/asparagus-weeds-management-manual-130486.pdf>
- Osmond, R., Verbeek, M., McLaren, D. A., Michelmore, M., Wicks, B., Grech, C. J., & Fullerton, P. (2008). *Serrated tussock – National best practice manual*. Victorian Department of Primary Industries.
- Osunkoya, O. O., Pyle, K., Scharaschkin, T., & Dhileepan, K. (2009). What lies beneath? The pattern and abundance of the subterranean tuber bank of the invasive liana cat’s claw creeper, *Macfadyena unguis-cati* (Bignoniaceae). *Australian Journal of Botany*, 57(2), 132-138. doi.org/10.1071/BT09033
- Page, A. R., & Lacey, K. L. (2006). *Economic impact assessment of Australian weed biological control* [Technical Series 10]. CRC for Australian Weed Management.
- Pagnoncelli, F. de B., Trezzi, M. M., Brum, B., Vidal, R. A., Portes, Á. F., Scalcon, E. L., & Machado, A. (2017). Morning glory species interference on the development and yield of soybeans. *Bragantia*, 76(4), 470-479. doi.org/10.1590/1678-4499.2016.338
- Phillips, O. L., Vasquez Martinez, R., Arroyo, L., Baker, T. R., Killeen, T., Lewis, S. L., Malhi, Y., Mendoza, A. M., Neill, D., Nunez Vargas, P., Alexiades, M., Ceron, C., Fiore, A. Di, Erwin, T., Jardim, A., Palacios, W., Saldias, M., & Vinceti, B. (2002). Increasing dominance of large lianas in Amazonian forests. *Nature*, 418, 770-774. doi.org/10.1038/nature00926

Chapter 6

- Prentis, P. J., Sigg, D. P., Raghu, S., Dhileepan, K., Pavasovic, A., & Lowe, A. J. (2009). Understanding invasion history: Genetic structure and diversity of two globally invasive plants and implications for their management. *Diversity and Distributions*, 15, 822-830. doi.org/10.1111/J.1472-4642.2009.00592.X
- Queensland Government. (2020). Richmond birdwing butterfly. <https://www.qld.gov.au/environment/plants-animals/conservation/threatened-wildlife/threatened-species/featured-projects/richmond-birdwing-butterfly>
- Rafter, M. A., Wilson, A. J., Senaratne, K. A. D. W., & Dhileepan, K. (2008). Climatic-requirements models of cat's claw creeper *Macfadyena unguis-cati* (Bignoniaceae) to prioritise areas for exploration and release of biological control agents. *Biological Control*, 44(2), 169-179. doi.org/10.1016/j.biocontrol.2007.10.015
- Raghu, S., & Dhileepan, K., & Treviño, M. (2006). Response of an invasive liana to simulated herbivory: Implications for its biological control. *Acta Oecologica*, 29, 335-345. 10.1016/j.actao.2005.12.003
- Richardson, D. M., Pyšek, P., Rejmánek, M., Barbour, M. G., Dane Panetta, F., & West, C. J. (2000). Naturalization and invasion of alien plants: Concepts and definitions. *Diversity and Distributions*, 6, 93-107. doi.org/10.1046/j.1472-4642.2000.00083.x
- Riahi, K., Van Vuuren, D. P., Kriegler, E., Edmonds, J., O'Neill, B. C., Fujimori, S., Bauer N., Calvin, K., Dellink, R., Fricko, O., Lutz, W., Popp, A., Cuaresma, J. C., Samir, K. C., Leimbach, M., Jiang, L., Kram, T., Rao, S., Emmerling, J., ... & Tavoni, M. (2017). The Shared Socioeconomic Pathways and their energy, land use, and greenhouse gas emissions implications: An overview. *Global Environmental Change*, 42, 153-168. doi.org/10.1016/j.gloenvcha.2016.05.009
- Schnitzer, S. A., Kuzee, M. E., & Bongers, F. (2005). Disentangling above- and below-ground competition between lianas and trees in a tropical forest. *Journal of Ecology*, 93, 1115-1125. doi.org/10.1111/j.1365-2745.2005.01056.x
- Sheehan, M. R., & Potter, S. (2017). Managing *Opuntoid Cacti in Australia – Best practice control manual for Austrocyllindropuntia, Cyllindropuntia and Opuntia species*. Department of Primary Industries and Regional Development (WA). <https://www.agric.wa.gov.au/invasive-species/opuntoid-cacti-best-practice-control-manual>
- Sherley, G. (2000). *Invasive species in the Pacific: A technical review and draft regional strategy*. South Pacific Regional Environment Programme.
- Shortus, M., & Dhileepan, K. (2010). Two varieties of the invasive cat's claw creeper, *Macfadyena unguis-cati* (bignoniaceae) in Queensland, Australia. *Proceedings of the Royal Society of Queensland*, 116, 13-21.
- Snow, E. L., & Dhileepan, K. (2013). Update of biological control research for cat's claw creeper and Madeira vine. In M. O'Brien, J. Vitelli, & D. Thornby (Eds.), *Proceedings of the 12th Queensland Weed Symposium* (pp. 15-18). The Weed Society of Queensland.
- Snow, E. L., & Dhileepan, K. (2014). The Jewel beetle (*Hylaeogena jureceki*): A new biocontrol for cat's claw creeper (*Dolichandra unguis-cati*) in Queensland. In M. Baker (Ed.), *Proceedings of the 19th Australasian Weeds Conference* (pp. 50–54). Tasmanian Weed Society.
- Snow, E. L., Palmer, W. A., & Senaratne, K. A. D. W. (2012). The release of *Plectonycha correntina*, a leaf feeding beetle for the biological control of Madeira vine. In V. Eldershaw (Ed.), *Proceedings of the Eighteenth Australasian Weeds Conference* (pp. 339-342). Weed Society of Victoria.

- Society for Ecological Restoration Australasia (SERA) Standards Reference Group. (2017). *National Standards for the Practice of Ecological Restoration in Australia* (2nd ed.). Society for Ecological Restoration Australasia.
- Sparks, H. E. (1999). The initiation of a biological control programme against *Macfadyena unguis-cati* (L.) Gentry (Bignoniaceae) in South Africa. *African Entomology Memoir*, 1, 153-157.
- Starr, F., Starr, K., & Loope, L. (2003). *Anredera cordifolia*. United States Geological Survey. http://www.hear.org/starr/hiplants/reports/pdf/anredera_cordifolia.pdf
- Stockard, J. D. (1996). Restoration of Wingham Brush 1980–1996. In R. C. H. Shepherd (Ed.), *Proceedings of the 11th Australian Weeds Conference 1996* (pp. 432-436). Weed Science Society of Victoria.
- Swarbrick, J. T. (1991). Towards a rating scheme for environmental weeds. *Plant Protection Quarterly*, 6, 185.
- Threatened Species Scientific Committee. (2010). *Advice to the Minister for the Environment, Heritage and the Arts from the Threatened Species Scientific Committee (the Committee) on Amendments to the List of Key Threatening Processes under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. <https://www.dcceew.gov.au/sites/default/files/env/pages/215ddf2d-5955-4974-b2c3-a7e99c14f5e3/files/garden-plants-listing-advice.pdf>
- Vivian-Smith, G., Lawson, B. E., Turnbull, I., & Downey, P. O. (2007). The biology of Australian weeds. 46. *Anredera cordifolia* (Ten.) Steenis. *Plant Protection Quarterly*, 22, 1-10.
- Vivian-Smith, G., & Panetta, F. D. (2004). Seed bank ecology of the invasive vine, cats claw creeper (*Macfadyena unguis-cati* (L.) A. Gentry). In B.M. Sindel and S.B. Johnson (eds.), *Proceedings of the 14th Australian Weeds Conference: Weed management – Balancing people, planet, profit* (pp. 531-534). Weed Society of New South Wales
- Watson, G. M., French, K. O., Burley, A. L., Brading, M. B., & Hamilton, M. A. (2021). *Monitoring manual for invasive and native flora: Guidance for field monitoring and reporting*. NSW Department of Planning, Industry and Environment. <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Pests-and-weeds/monitoring-manual-for-invasive-and-native-flora-210638.pdf>
- Webber, B. L., Yeoh, P. B., & Scott, J. K. (2014). *Invasive Passiflora foetida in the Kimberley and Pilbara: Understanding the threat and exploring solutions* [Phase 1 Final Report]. CSIRO.
- WeedFutures.net. (2014). Species profile. <https://weedfutures.net/species.php?id=2050>
- Weeds of Australia. (2022). *Gloriosa superba*. https://keyserver.lucidcentral.org/weeds/data/media/Html/gloriosa_superba.htm
- Zhang, X., Wei, H., Zhao, Z., Liu, J., Zhang, Q., Zhang, X., & Gu, W. (2020). The global potential distribution of invasive plants: *Anredera cordifolia* under climate change and human activity based on random forest models. *Sustainability (Switzerland)*, 12(4), 1491. doi.org/10.3390/su12041491



Invasive vines

